Effect Of Sc Addition on the Microstructure and Wear Properties of A356 Alloy And A356–Tib2in Situ Composite

S.L. Pramod[a], A.K. Prasada Rao[b], B.S. Murty[a], Srinivasa R. Bakshi[a]
[a]Department of Metallurgical and Materials Engineering, Indian Institute of Technology, Madras, Chennai 600036, India
[b]Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, Pekan, Malaysia

ABSTRACT

In this study, the effect of Sc addition on the grain refinement, modification of the eutectic Si, mechanical and wear properties of A356 and A356–10 wt% TiB_2 *in situ* composite has been investigated. The A356–10 wt% TiB_2 composites were prepared by an *in situ* reaction between K_2TiF_6 and KBF_4 salts, which are added in proper stoichiometric ratio to form TiB_2 in the A356 alloy melt at a temperature of 1073 K (800 °C). Al–2 wt% Sc master alloy was added to A356 and A356–10 wt% TiB_2 melt to introduce 0.2 and 0.4 wt% Sc in the alloy and the composite. Addition of Sc reduced the secondary dendrite arms spacing (SDAS) by 50% and changed the Si morphology from needle-like to fine spheroidal particles. Microstructure of Sc modified alloys which were cast for different holding times of 0, 30, 60 and 120 min indicated that there was no fading or poisoning effect on the SDAS and eutectic Si morphology. Hardness was found to increase due to addition of Sc and TiB_2. Pin-on-disk wear tests indicated that Sc addition increase the wear resistance of A356 alloy but reduced the wear resistance of A356–TiB_2 composite.

KEYWORDS: Grain refinement; Si modification; Fading; A356; Scandium; TiB2; Composite; SDAS

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